



The Geneva Internet voting system

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Introduction

The World Wide Web was born at CERN (European Laboratory for Nuclear Research) back in 1990. Thanks to its simplicity and user transparency, Internet could go beyond the academic world to become part of our daily lives. Although we cannot yet foresee its full impact on society, we feel that a deeply rooted change is at work. The web closes a cycle of what has been called the “IT revolution” by introducing full interconnectivity and standardising computer programming language. It is a powerful democratic and popular tool.

Today the keyword most often associated with Internet in Europe is eGovernment. This many-faceted concept encompasses anything from an online tax declaration and payment to an online license renewal or direct access to authorities through e-mail or chat sessions.

Under the impulse of the Swiss federal government, three cantons began working in the field of online democratic rights: Geneva, Neuchâtel and Zurich. In March 2001, the Geneva State Council (government) officially launched the project by choosing its partners. Internet voting will however not replace the existing ballot forms, the traditional ballot box and postal voting, but is offered as a supplementary way of casting a ballot.

International context

Many States are currently working on electronic voting (e-voting) solutions. This expression covers a broad range of ballot systems, from electronic ballot reading devices, to electronic ballot boxes installed in polling stations, activated by buttons or touch screens, or to mobile phone voting systems.

Only the United Kingdom and Switzerland have reached the step of developing an Internet voting application. Yet, while the Brits are still trying to define whether or not it is convenient for them to implement it¹, Switzerland has taken a somehow more determined approach.

Why did we decide to launch the project?

Each of the States that is developing or considering the development of an Internet based polling system has its own reasons. What are ours?

It might seem odd that an Internet voting system is being developed in a country apparently so fond of traditions, where in some places citizens still gather in the central square on Sundays to vote by raising their hand. Yet, there is a set of reasons why we embarked on this project.

- In our “direct democracy system”², citizens are called four to five times a year to the ballot, sometimes more. Convenience is the keyword of the voting procedure. Postal voting is now used by some 95% of voters in Geneva. Its introduction has increased participation by 20

¹ For the UK, cost is an important issue. A ballot cast in a polling station costs 1 pound and 2 pounds by post, The goal is to reduce it to 0,50 pound. (Source: Council of Europe http://www.coe.int/t/e/integrated%5Fprojects/democracy/Activities/list_e-voting.asp#TopOfPage).

² Direct democracy is a system where citizens take decisions normally taken by their representatives (parliament). It would be more correct to call the Swiss system “semi-direct democracy”, since citizens can, under certain conditions, exert censorship on newly voted laws as well as proposing new legal provisions.

Learn more on <http://www.geneve.ch/chancellerie/E-Government/e-voting.html>

percentage points. While Geneva lagged at the bottom of the turnout list ten years ago, it is now one of the cantons with the highest participation in ballots. Internet voting is aimed at consolidating this trend towards remote voting and stronger turnout.

- Direct democracy also offers a breeding ground for Internet voting, because the elected members of parliaments, municipal, cantonal or federal, are used to seeing their decisions challenged in the poll. There is no fear of desacralisation of the institutions, of the act of voting, nor of the legal system, by introducing such a polling method. Such fear exists in countries where the Parliament has greater power than in Switzerland.
- According to the Federal Statistics Office, some 55% of the Swiss population has Internet access, usually both at home and at the workplace. One Swiss in three surfs the web daily.
- Out of the 5.6 million Swiss citizens (for an overall population of some 7 million), 580.000 live abroad. It is important to provide them also with an efficient and simple voting system. This is also true for the disabled people living in Switzerland.
- The public service must adapt itself to the lifestyle of the people it serves. Therefore, our administration has to take into account the public's growing demand for a broad range of on-line services, without discarding the more traditional ways of serving its citizens.
- The fact that Geneva is home to the ITU (International Telecommunication Union), CERN, and WIPO (World Intellectual Property Organisation) plus further organisations and companies dealing with IT and new technologies, demands a proactive attitude by Geneva's public services in regard to these technologies.

In defense of public service

There is another point in developing an Internet ballot system. The computer and software industry is working hard at developing eGovernment and eVoting solutions. Some companies are already selling "ready to use" Internet voting solutions. If States do not act now, by defining their needs and developing their own solutions, they will shortly be facing a closed market, dominated by private companies. The only choice left will be to decide whether to buy, say a Microsoft voting system or an Oracle voting system, to name but two big players.

We think that voting is not something that can be left blindly to the private sector. That is why we involved the CTI (Centre des technologies de l'information, the Geneva State computing center) in the development, in partnership with two locally installed companies, Hewlett Packard and Wisekey. By so doing, we were able to bring our own requirements to the negotiating table and create an application that respects our legal constraints and local voting habits. The Geneva State owns this application; it cannot be resold anywhere else and we know it thoroughly. There is no "black box" protected by copyrights preventing us access to some of its components.

Besides technical and legal points, the terms of reference that the private partner we choose has to abide by state that *"it must be possible for specialists external to the State of Geneva and who don't have any link to the State's partner company to examine thoroughly all the software dealing with the ballots. These specialists must among other things be able to check that the voters' identity is not linked to the electronic ballot and that the ballots cannot be modified."* This requirement makes us owner of the application, which, although it is based on proprietary software (no offer was made based on open source software), can be scrutinized and analysed to its roots.

We will make the source code available in our premises to those who request it.

Prerequisite for a democratic ballot on Internet

What is the prerequisite of a democratic ballot? It is defined by the 3rd Article of Protocol 1 of the European Convention on Human Rights. This article states that the "contracting parties undertake to hold free elections at reasonable intervals by secret ballot, under conditions that ensure the free expression of peoples opinion in choosing their legislature."

Based on this, we defined the 10 rules that our system must fulfil:

- 1. The votes can not be intercepted, modified, nor diverted;**
2. Nobody will have access to the votes before the official opening of the eBallot box;
3. Only registered voters will have access to the eVoting application;
4. Each voter will be able to vote only once, using whatever voting method he or she has chosen;
5. The secrecy of the vote will be guaranteed. There will NEVER be a link between a vote and a voter;
- 6. The eVoting site will resist any attack;**
7. Voters will be protected against any attempt of identity theft;

8. The number of cast ballots will be equal to the number of received ballots;It could be proved that a given voter has cast a ballot;
10. **The system will not accept any vote outside the voting period;It will be possible for legally designated authorities to check the proper functioning of the system.(The specific requirements of the Internet voting application are in bold. Requirements common to all ballots are in normal characters.)**

Democratic control – procedural security measures

We also took into account that, by law, ballot box opening is open to any citizen and is monitored by representatives of the political parties. While it is not possible to accept any citizen for the electronic ballot box opening (a crowd gathering around the server would diminish the security and control of the operation, instead of increasing it), we have increased the range of controls and the role of the political parties representatives.

The electronic ballot box is locked with two digital keys (passwords), which are defined by the political parties representatives and which are known only to them. This measure, combined with the impossibility to access the electronic ballot box before the official opening day, prevents any illegal opening. By so doing, we have a cross check at the ballot box opening and we preserve the rule that requires a democratic control of the ballot box opening.

The political parties representatives have another function in the whole process: they cast a large number of “test votes” in an “test electronic ballot box” and record what they have voted. The result of this ballot must match the votes that have been cast, in both number and content. We ensure this way that there is no bias introduced by the software used in the system and no lost votes.

Technical security measures

The security of any system has two sides: a technical one and a human or procedural one. The latter is described above. What about technical safety?

- On the Internet, the ballot is encrypted by randomly mixing alphanumerical characters to the content of the ballot. To use a metaphor, we can say that our server pulls a sealed cover to the voter’s computer, to protect the ballot on its way back to our server. Anyone who would get hold of the ballot (a very improbable occurrence) would see only a meaningless series of numbers.
- When the ballot is returned to the voter, for confirmation of his choice and to add his ID features, there is another protective layer, namely a picture which is woven into the ballot in order to make it still more difficult for hackers to read. This image, unique for each voter, is also a way for him to verify that he is connected to the official eVoting site and not to a counterfeit site.
- Of course, our site is also certified. The voters can view the authentication certificates.
- Voters identity and ballots are kept in two distinct files.
- Before opening, the content of the electronic ballot box is shaken by applying an algorithm, so as to change the order in which the ballots will come out. This prevents any matching entries in the voters register and the electronic ballot box, matching which could allow a cross-reading (who voted for what).

How does it work?

The solution we developed is based on the existing voting material and does not require any additional features on the voters’ computers. The central tool of the current voting material is the voting card citizens receive at home. This card is renewed for each ballot and must be presented when voting, or sent back with the postal ballot. For eVoting, we simply added a personal identification number to the card. This number changes for every ballot. When voting on the Internet, voters will use this number to identify themselves on our server.

The Internet voting transaction has four stages:

1. To be recognized as a citizen being entitled to vote, the voter gives his card number. He has five attempts to do so. If you try inserting random numbers, your chance to find an existing number is one in five billion. When recognized as an authorized voter, the connexion is made with a secure server and the voter is sent an e-ballot
2. He votes;
3. The system submits a recapitulation of his choices. The voter confirms or alters his choice and confirms his identity by giving his birth date, his municipality of origin out of a list of 50 names that is presented to him (this Swiss special administrative feature is very tricky to guess or

counterfeit) and his secret code, stamped on his voting card, but hidden behind a rubber stamp;

4. The system confirms it has recorded the vote by giving the date and time of the recording.

All navigation tools as well as the "print screen" button on the computers' keyboard are deactivated during the process. The voter has to use the tools provided and cannot print his ballot. The computer buffer memory is emptied when the voter leaves the voting web site.

What do people think of it?

What do people think of it? We asked Geneva university to accompany the project with legal and socio-political studies. These have revealed that there is a two third majority supporting the implementation of Internet voting. There is still a majority supporting the Internet voting among the some 45% of the people who do not use Internet.

We tested our application on a representative sample of Geneva citizens and learned that using the Internet voting application increases public support. The ballot in Anières will be the opportunity to better know our "audience".

How much does it cost?

The development of our application should cost about 2 million Swiss francs (1,35 million US dollars). But, as you know, new technologies are constantly evolving. Our application will never be achieved, we will have to adapt it to new IT threats or techniques. There is a cost attached to it, yet the goodwill and experience we are gaining through this project is invaluable.

Shape or suffer

Which shape will the relationship between citizens and the State assume in the future? The two possible attitudes to this issue can be summarized by a quote. Back in the 19th century, the French essayist Émile de Girardin wrote that « ruling is foreseeing » ? More than one century later, another French essayist, Joël de Rosnay, answered him : « The best way to predict future is to carve it. » Foresee or carve? Who was right, from the 19th century or the late 20th century man? Both, probably.

The rhythm of technical developments imposes that we anticipate the citizens' upcoming expectations. For public authorities, waiting for the « right time » to embark on new technological trends means watching the train pass by. We have to foresee the public's expectations and new behaviour and, in trying to fill them, we have to make decisions and choices that carve the future, for the best! This is what we are doing in Geneva, with the support of the canton authorities and of the Confederation.

And now

In Switzerland, the first official ballot for which citizens can vote through Internet began on January the 7th 2003, in the municipality of Anières (Geneva). The 1150 or so registered voters living there can cast a ballot on the Internet or by post until Saturday January the 18th at midday. They have to accept or reject a 4,3 million Swiss francs credit (2,9 millions Euro) aimed at restoring a communal building. Sunday January the 19th, the polling station will be open until noon, after which the ballot's results will be published. This modest launch, similar to the postal voting introduction back in 1991, signs the beginning of a new era for political rights in Switzerland.

We hope to organise in the autumn a larger scale ballot for which Internet will be made available as polling method. Before that, we will have to draw lessons from this first on-line vote. This will take us a few weeks.

Robert Hensler
Geneva State Chancellor
Head of the Internet voting project